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D E C I S I O N
of 20 March 1995

Case Number: T 0436/92 - 3.3.2
Application Number: 86301597.0
Publication Number: 0194811
IPC: C04B 35/80

Language of the proceedings: EN

Title of invention:
Reinforced ceramic cutting tools

Patentee:
Advanced Composite Materials Corporation

Opponent:
(01) KRUPP WIDIA GMBH
(02) Hertel AG Werkzeuge + Hartstoffe
(03) Kennametal Inc.,
(04) Geigenberger, Gerhard

Headword:
Cutting tools/ACMC

Relevant legal provisions:
EPC Art. 54, 55(1), 56, 84, 87, 89, 114, 123

Keyword:
"Admissibility of late filed documents - partly"
"Amendments allowable - yes"
"Clarity - yes"
"Non-prejudicial disclosures in consequence of evident abuse -
no - no proof of deliberate breach of confidentiality
agreement"
"Prior use - not public"
"Novelty of main request and first auxiliary request - no"
"Novelty of second auxiliary request - yes"
"Inventive step - yes - unexpected improvement - against the
trend"

Decisions cited:
T 0313/86, T 0173/83, T 0201/83, T 0735/91, T 0585/92,
G 0002/88

Catchword:
-



Case Number: T 0436/92 - 3.3.2

D E C I S I O N
of the Technical Board of Appeal 3.3.2
of 20 March 1995

Appellant:
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Representative:

Decision under appeal:

Decision of the Opposition Division of the
European Patent Office dated 29 February 1992
revoking European patent No. 0 194 811 pursuant to
Article 102(1) EPC.

Composition of the Board:

Chairman: I. A. Holliday
Members: U. Oswald
C. Holtz

Summary of Facts and Submissions

I. European patent No. 0 194 811 relating to reinforced ceramic cutting tools was granted on the basis of eight claims in response to the European patent application No. 86 301 597.0 filed on 6 March 1986 and claiming priorities from the United States applications US 711 695 filed on 14 March 1985 and US 830 773 filed on 18 February 1986.

Independent Claim 6 as granted reads as follows:

"6. A whisker-reinforced ceramic cutting tool characterised in that it is formed of a sintered matrix consisting essentially of alumina with silicon carbide whiskers in an amount in the range of 2 to 40 volume percent distributed therethrough."

II. Four oppositions were filed against the granted patent. Of the numerous documents cited during the opposition proceedings, the following remain relevant to the present decision:

- (1) Greenleaf advertisement in the March 1985 edition of "Tooling & Production" magazine, Vol. 50, No. 12 (Exhibit 25 of Opponent 03)
- (2) US-A-2 979 414 (Exhibit 15 of Opponent 03)
- (3) Communications of the American Ceramic Society, December 1984, pages C-267 to C-269 (Document 1 of Opponents 01 and 03).
- (4) "Hartmetalle", R Kiefer und F Benesovsky, 1965 Springer Verlag Wien-New York, pages 493, 494, 510, 511 (Document 2 of Opponent 01).
- (5) American Ceramic Society Bulletin, 64 [2] (February) 1985, pages 298 to 304 (Document 4 of Opponent 01 and Document 2 of Opponent 03).

- (6) C&EN Special Report, July 9 1984, pages 26 to 40.
- (7) Ullmanns Encyklopädie der Technischen Chemie, 17. Band "Terpentinölprodukte bis Uran und - Verbindungen, dritte Auflage 1966, pages 569 to 580 (Document 5 of Opponent 01).
- (8) Werkzeugmaschine International, Jahrgang 1972, Nr. 4, August 1972, pages 24 to 26 (Document 4 of Opponent 02).
- (9) Zwf 78 (1983)11, H.Kunz u.a.: Einsatzverhalten von Schneidkeramik, pages 529 to 540 (Document 5 of Opponent 02).
- (10) JP-60/5079 Abstract (Document 8 of Opponent 01)

III. The Opposition Division revoked the European patent on the grounds that the subject-matter of the claims as granted lacked both novelty and inventive step.

The Opposition Division took the view that according to document (1), the so-called Greenleaf advertisement, which was placed on the open shelves of a library on 6 March 1985, and taking into account the Patentee's submission concerning the meaning of the trade name WG-300, ceramic cutting tools as presently claimed were available to the public before the priority date of the patent in suit. On the basis of the information given in this advertisement, the skilled person had to determine only the nature of the ceramic matrix and the amount of the silicon carbide whiskers.

In the event that the WG-300 product was not available to the public before the priority date of the patent in suit, it was obvious on the basis of the information given in document (1) alone to replace silicon carbide particles in the alumina based cutting tool known from document (2) by silicon carbide whiskers to arrive at the subject-matter presently claimed.

IV. The Appellant (Proprietor of the patent) lodged an appeal against the said decision. In the Statement of Grounds and during the further written procedure, the Appellant sought to introduce numerous new documents most of which were presented in order to demonstrate that the publication of document (1) was based on an evident abuse within the meaning of Article 55(1) EPC, and that therefore document (1) should be disregarded.

Oral proceedings took place on 15 March 1995. The Appellant filed a main request and two auxiliary requests. The second auxiliary request reduced the range of silicon carbide whiskers to 12 to 40 vol.%.

In the course of the oral proceedings the Board informed the parties that the Japanese document 73-027891 filed with letter dated 1 March 1993 was excluded from the procedure for lack of relevance.

An alleged prior use which Respondent 03 sought to introduce with a letter dated 6 March 1995 was also disregarded under Article 114(2) EPC since it did not unambiguously relate to a non-confidential prior use.

V. The arguments of the Appellant, both in the written procedure and at the oral proceedings, may be summarised as follows:

In revoking the patent, the Appellant considered that the Opposition Division had incorrectly based the decision on the disclosure of document (1).

The Appellant sought to deny that any of the journals in which the advertisement appeared was available to the public before the priority date of the patent. Under the special circumstances existing at that time no member of the public had even been allowed to have a sample of

WG-300 in his possession let alone been able to detect the inherent properties of the product before the priority date. Respondent 03 did not explain how the company had obtained possession of WG-300. Moreover, it was most likely that Respondent 03 got a WG-300 sample "in an unclean way". Accordingly, this Respondent had not proven public prior use in the meaning of availability and full enabling disclosure.

However, even if the advertisement were to be regarded as having been made available to the public, it was necessary to take into account a confidentiality agreement executed between the legal predecessor ARCO of the patentee APMC and the company NUCERMET, a wholly-owned subsidiary of GREENLEAF. Thus, the Appellant argued that the publication of the Greenleaf advertisement in document (1) and in several other technical journals was based on an evident abuse within the meaning of Article 55(1) EPC. Decisions of the Boards of Appeal, e.g. T 173/83, as well as the review of the documents of the 1973 Munich diplomatic conference showed that Article 55 EPC was open to an interpretation which admitted cumulation of the grace period and the priority period.

The Appellant firstly argued that non-cumulation of the 6 month period under Article 55 EPC with the priority date under Article 89 EPC would lead to absurd results. Firstly, in a situation where a priority is claimed, the grace period allowed by Article 55(1) must be interpreted to relate to that document. In other words, the 6 month period must be calculated from the priority date. The value of a priority right would otherwise be prejudiced and would contravene Article 4 of the Paris Convention on the right to priority protection. Since

most applications claim priority, the right to defence through abuse under Article 55 EPC would otherwise lose almost all its significance.

Secondly, Article 55 refers back to Article 54 EPC. Both define the grace period in terms of the filing of the European patent application. Article 89 EPC, defining the effect of priority rights, does not refer to Article 55 because the definition of prior art in Article 54 in conjunction with Article 55 already is valid for all subsequent references to prior art in the EPC. In the same manner, Article 89, makes no reference to Article 56 although there is no doubt that the state of the art concerning inventive step is defined in terms of priority. A decision of an Opposition Division of 8 July 1991 (appl. 82 107 958.9) was mentioned which confirmed these conclusions. However, appeal T 735/91, relating thereto was rejected as inadmissible for lack of a Statement of Grounds.

Thirdly, the Swiss decision (GRUR int. 1992, 293) invoked by Opponent 01 must be criticised for having irrelevantly quoted the language of Article 87 EPC, which defines the period of priority as "twelve months from the date of filing of the first application", although Article 55 EPC never could refer to a "first application" as Article 54 only mentions European applications as such.

In other words, it was argued that Article 55 EPC must be applicable to abuse relating to events prior to the priority date.

In contrast to the Opposition Division's opinion, the closest prior art was the so-called Whitney report document (11), filed by Respondent 03 on 26 February 1993 and available to the public in 1972.

"New and Improved Cutting Tool Materials", The Carborundum Company, Niagara Falls, New York, March 1969, pages 1 to 580.

Document (11) concerned the same general problem as the present invention, namely to develop a new cutting tool material for effectively increasing the machining productivity and disclosed a matrix consisting essentially of alumina with 5 weight percent of silicon carbide whiskers. The result of the cutting tests, however, were disappointing. The reason was that in 1969 the skilled worker was not aware of the fact that the whiskers used according to this state of the art coming from a so-called Acheson furnace were degraded to less than 2%. Accordingly, these "whiskers" could not be regarded as whiskers within the meaning of the patent in suit. The prior art did not suggest that the quality of the silicon carbide whiskers would have such a significant effect on the overall cutting tool performance and in particular on the tool life of an alumina insert. According to the decision G 2/88 (OJ EPO 1990, 93) such a surprising effect when substantiated by the examples of the patent in suit, as it was in the present case, must be read into the claim to establish novelty over known products. The particular problem underlying the patent in suit was therefore to improve the tool life of alumina based cutting materials. In comparison to examples "D" and "E" the tool life of the cutting material according to the invention was surprisingly improved. Apart from the fact that it was not possible to identify the encoded test probes of document (14):

Metcut-Report No. 2312-38101-1 of Metcut Research Associates Inc. (Exhibit 43 of Respondent 03)

and also the public availability of said report was questionable, the demonstrated effect was in no way overruled by the results presented therein.

Moreover, none of the other documents cited during the proceedings was related to the general teaching that an addition of any whisker to any ceramic matrix improved the tool life of the ceramic matrix when used as a cutting tool.

All of the new evidence presented in February and March 1995 by Respondent 03 should be disregarded by the Board in accordance with Article 114(2) EPC.

- VI. Respondent 03 took the view that the agreement under discussion was a standard vendor's agreement between a customer and a vendor. As a consequence of the special relationship between the parties signing the agreement, there was no legal obligation to keep the disclosure of the advertisement according to document (1) confidential. It was perfectly logical that one collaborator would not complain about the promotional efforts of the other collaborator when their common goal was to sell the WG-300 cutting tool. The facts clearly showed that before the priority date there was an aggressive campaign to pursue markets for the SiC-whiskers, in particular for cutting tool applications. Therefore, the most pertinent prior art was WG-300 cutting insert itself, which was publicly available before the priority date. The WG-300 insert was in the possession of, and had been analyzed by, the ultimate member of the public, a competitor, i.e., Kennametal the Respondent.

Since Mr Walter J. Greenleaf had admitted that the WG-300 cutting insert embodied the invention, it is clear that the use of the WG-300 cutting insert fully anticipated Claims 1 and 5.

Moreover, there could be no doubt that a written disclosure of this product, the so-called WG-300 advertisement was published in document (1) and in three other technical journals. The affidavits by employees of the Cleveland Public Library and Battelle Memorial Institute, show clearly that the product WG-300 was marketed before the priority date.

Respondent 03 argued that once the research and development work had been successful, both companies had a common interest in marketing and selling the new product to start getting returns on their investment. Thus, the Respondent considered there had been no abuse within the meaning of Article 55(1) EPC.

Respondent (01) further argued that Article 55(1) EPC was not applicable to abuse concerning a use prior to the priority date. This defence is only available with regard to the filing date of the European patent application itself (Singer, EPÜ 1989, Artikel 55, Rdnr 4). Germany, France, Italy, the Netherlands and Sweden had all legislation which excluded cumulation of the 6 month period under Article 55 and the priority year under Article 89 EPC. A decision of 14 August 1991 by the Swiss Bundesgericht referred to above confirms that this was the interpretation intended by the 1973 Munich diplomatic conference adopting the EPC.

It was accepted that the said advertisement, separately taken into account, did not expressly describe an alumina based cutting tool and the quantitative proportion of whiskers. However, in the light of the teaching of documents (2) to (9) and document (12):

"Silicon Nitride Whisker and Silicon Carbide Whisker of Tateho Chemical Industries CO., LTD."
(Exhibit H attached to letter 26 February 1993 of Respondent 03, available to the public on September 1984),

it was clear that the person skilled in the art would have had chosen alumina, well known as the ceramic tool material since about 1900 up to the priority date of the patent in suit, as the matrix material with an amount of silicon carbide whiskers within the claimed range. It was also possible only on the basis of the electron microscopic pictures of the advertisement to calculate the whisker content of the matrix. There was in particular no prejudice against the use of an alumina matrix in combination with SiC whiskers when cutting materials other than steel since document (13):

"Powder Metallurgy International", Vol. 15, No.4, 1983, pages 201 to 205 (Document 46 of Respondent 03),

explained the physico-chemical background why SiC whiskers interacting with the iron compound in steel failed to show good test results when cutting steel.

As regards the prior art according to document (11) for the same reasons a person skilled in the art would not disregard the use of the alumina-SiC-whisker composite disclosed therein for other workpieces than steel. At the priority date of the patent in suit, it was beyond

dispute that SiC whiskers having an excellent quality were commercially available. Therefore, this prior art disclosing alumina-magnesia bodies containing 5 wt% of SiC-whiskers fully addressed the claimed subject-matter.

The present claims also were to be regarded as not clear within the meaning of Article 84 EPC since there was no guidance about the meaning and/or the scope of the new features relating to the cutting conditions, the content of alumina in the matrix and the degradation of the whiskers.

However, in the light of document (14) the so-called Metcut-Report, prepared for ARCO, the predecessor of the Appellant, relating inter alia to turning machining conditions of the presently claimed material, it was clear that no improvement over known tool materials had been achieved. According to document (15):

the Affidavit of Dr Ronald L. Peters (Exhibit 39 of Respondent 03),

the Metcut-Report (14) was available to the public.

VII. The independent claims according to the main request and the first and second auxiliary requests filed during the oral proceedings read as follows:

Main request

"1. A method of cutting metal, but not steel,
wherein a cutting tool is brought into contact
with a metal workpiece
and the cutting tool and metal workpiece move
relative to each other
whereby metal is removed from the metal workpiece
by the cutting tool

c h a r a c t e r i z e d i n t h a t

there is used a sintered composite cutting tool having a matrix consisting essentially of alumina with silicon carbide whiskers in an amount in the range of 2 to 40 volume percent distributed therethrough.

6. A whisker-reinforced ceramic cutting tool, for cutting metal except steel

characterized in that it is formed of a sintered matrix consisting essentially of alumina

with silicon carbide whiskers in an amount in the range of 2 to 40 volume percent distributed therethrough."

Auxiliary request I

"1. A method of cutting metal, but not steel,

wherein a cutting tool is brought into contact with a metal workpiece

and the cutting tool and metal workpiece move relative to each other

whereby metal is removed from the metal workpiece by the cutting tool having a tool life as indicated in Metres of work travel of metal cut for a specified set of cutting conditions, in particular cutting speed and feed rate,

c h a r a c t e r i z e d i n t h a t

there is used a sintered composite cutting tool having a matrix consisting essentially of alumina with silicon carbide whiskers in an amount in the range of 2 to 40 volume percent distributed therethrough and not being significantly degraded.

6. A whisker-reinforced ceramic cutting tool, not for cutting steel,

having a tool life as indicated in Metres of work travel of metal cut for a specified set of cutting conditions, in particular cutting speed and feed rate, characterized in that it is formed of a sintered matrix consisting essentially of alumina with silicon carbide whiskers in an amount in the range of 2 to 40 volume percent distributed therethrough and not being significantly degraded."

Auxiliary request II

"1. A method of cutting metal, but not steel,

wherein a cutting tool is brought into contact with a metal workpiece

and the cutting tool and metal workpiece move relative to each other

whereby metal is removed from the metal workpiece by the cutting tool having a tool life as indicated in Metres of work travel of metal cut for a specified set of cutting conditions, in particular cutting speed and feed rate,

c h a r a c t e r i z e d i n t h a t

there is used a sintered composite cutting tool having a matrix consisting essentially of alumina with silicon carbide whiskers in an amount in the range of 12 to 40 volume percent distributed therethrough and not being significantly degraded.

5. A whisker-reinforced ceramic cutting tool, not for cutting steel,

having a tool life as indicated in Metres of work travel of metal cut for a specified set of cutting conditions, in particular cutting speed and feed rate,

characterised in that it is formed of a sintered matrix consisting essentially of alumina with silicon carbide whiskers in an amount in the range of 12 to 40 volume percent distributed therethrough and not being significantly degraded."

VIII. The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of either the main request, auxiliary request I or auxiliary request II, all submitted in the oral proceedings on 15 March 1995.

The Respondents requested that the appeal be dismissed.

IX. The Decision to maintain the patent according to the second auxiliary request was announced on 20 March 1995.

Reasons for the Decision

1. The appeal is admissible.

2. *Admissibility of Documents*

Except for the documents mentioned under point IV above, the Board regards each item of the new evidence filed by the parties at the appeal stage either as a logically consistent response to the Opposition Division's decision or being relevant when deciding on the particular question of evident abuse in the present case. The same applies with respect to the relevance of the documents filed after expiry of the nine month opposition time limit (Article 99(1) EPC).

In the statement of grounds of appeal the Appellant objected that the Opposition Division, after deciding to admit document (1) after expiry of the nine month period i.e. only one week prior to the oral proceedings, was wrong to reject the request to file further written arguments at a later stage of the proceedings. In view of the relevance of this document and the fact that it contained only very simple and easy to comprehend technical matter the Board sees no substantial procedural violation.

3. *Amendments of the claims*

3.1 The following features not contained in the set of claims as granted form part of the present product claims and in adapted form as part of the present method claims according to the main request and/or the first and/or second auxiliary request:

- (i) "A whisker-reinforced ceramic cutting tool, not for cutting steel" (first and second auxiliary request) ["for cutting metal except steel" (main request)]
- (ii) "...having a tool life as indicated in Metres of work travel of metal cut for a specified set of cutting conditions, in particular cutting speed and feed rate..." (first and second auxiliary request)
- (iii) "...silicon carbide whiskers in an amount in the range of 12 to 40 volume percent..." (second auxiliary request)
- (iv) "...silicon carbide whiskers ...not being significantly degraded." (first and second auxiliary request).

- 3.2 In accordance with the decision T 313/86 of 12 January 1988, in particular point 3.5 of the reasons for the decision, said feature (i) above is allowable in that it excludes a part of the subject-matter of Claim 1, namely a partial lack of function of the cutting tool for a defined workpiece, in the form of a disclaimer in regard to the technical problem to be solved (cf. point 7 below).
- 3.3 Feature (ii) above comprises nothing else than the normal requirements for a product to be suitable as a cutting tool.
- 3.4 The new range of compositions according to feature (iii) above corresponds to the upper limit of the preferred range to be found in Claim 5 and on page 4, line 12 of the description of the specification (Claim 3 and page 9, line 26 originally filed), and to the upper limit of the more general range to be found in Claim 1 and on page 4, line 4 of the description of the specification (Claim 1 and page 9, line 13 originally filed); such a new combination of values of different ranges is clearly allowable in accordance with decision T 201/83 OJ EPO 1984, 481.
- 3.5 Feature (iv) is to be found on page 4, lines 42 to 44 (page 11, lines 5 to 9 as originally filed).
- 3.6 The claims are of narrower scope than the granted claims. The requirements of Articles 123(2) and 123(3) EPC are accordingly satisfied.
- 3.7 The dependent claims correspond to the dependent claims as granted but renumbered.

4. *Clarity and Support of the Claims (Article 84 EPC)*

4.1 Bearing in mind the conclusions reached above under paragraphs 3.2 and 3.3 in respect of Article 123 EPC, the Board sees no reason to follow the Respondent's objection regarding the claims with respect to features (i) and (ii) as indefinite.

4.2 According to the explanations given in the description of the specification and as originally filed (cf. point 3.5 above) exclusively referring in context with the silicon carbide whiskers of the invention to a possible mechanical degradation and not even referring implicitly to a chemical degradation process, there is clearly no basis when reading the claims in combination with the description for assuming ambiguity of the term degradation.

4.3 The Board is therefore satisfied that the claims according to the main request as well as the first and secondary auxiliary request are clear and have adequate support in the description.

5. *Non-prejudicial disclosure*

5.1 In the course of the proceedings there was considerable discussion as to whether or not Article 55 EPC applies to events before the priority date (the so-called "cumulation" issue). The Board would like to remark that "cumulation" is a misleading term, since the defence of evident abuse does not put back the priority date (cumulating another six months to it). The only legal effect is that the particular prior use is disregarded. All other documentation prior to the priority date as claimed remains state of the art. Although the applicability of Article 55 EPC rightly should be the

first to be decided by the Board, in view of the conclusion below that the publication of D1 did not constitute an evident abuse, the Board forgoes a discussion on this point, presuming that the Article in question does apply.

5.2 Although the confidentiality agreement was not signed on behalf of Greenleaf Corporation, the Board has found that the fact that Greenleaf immediately took part in the development work and other relevant circumstances at least indicate a common understanding that Greenleaf was bound by the agreement, albeit tacitly. Greenleaf therefore was not at liberty to disclose any information about the cooperation without permission from ACMC.

The Appellant has the burden of proof that the publication constituted **evident abuse**. This term indicates that mere negligence or breach of confidentiality does not suffice. Deliberate intention to harm the other party would constitute evident abuse, as probably also knowledge of the possibility of harm resulting from a planned breach of this confidentiality. The state of mind of the "abuser" is of central importance (cf. T 585/92 of 9 February 1995 to be published in the OJ EPO, point 6 of the reasons).

In the present case, the affidavits by Mr Greenleaf differ somewhat. In his first declaration he stated that the publication of the advertisements took place inadvertently (point 5 in P/6). In the third one, Mr Greenleaf stated that he was aware of the confidentiality agreement, but did not seek the approval of ARCO (the predecessor of ACMC). He assumed that ACMC would not object to the promotion of the new product. He did not advise any one at ARCO or ACMC that he was planning any advertisement. All decisions were taken by Greenleaf Corporation alone.

The above suggests that Respondent 03 may well be right in supposing that both companies were working together and that the absence of any objections from ACMC could be assumed to indicate that - even if not having expressly given their permission to the advertisements - ACMC at least, after the fact, condoned the Greenleaf initiative. The claim by ACMC that there was no response to the 19 February 1985 letter because it never reached them has not been supported by any independent evidence. If the confidentiality agreement had still been enforced by ACMC, there would at least have been a reaction after the magazines in question had been published, if for no other reason than to be in a position to prove that ACMC considered the advertisement to be in breach of the agreement and therefore constituted abuse under the law.

The Board therefore finds that the Appellant has not proven, on the balance of probability, that the publications occurred in violation of the tacitly agreed confidentiality. In other words, the publication was not an evident abuse within the meaning of Article 55(1) EPC.

6. *Public prior use of the product WG-300*

Although prior use relates to a lack of novelty in terms of Article 54(2) EPC, it is more convenient to consider it at this stage of the decision since the conclusion has an influence on the nearest prior art when considering the problem underlying the patent in suit.

The Board agrees with the Appellant's submissions that none of the presented "Exhibits" clearly and unambiguously showed under what circumstances the alleged use of WG-300 occurred, e.g. place of alleged use and possible secrecy agreements.

Moreover, at the oral proceedings before the Board, Respondent 03 made no reply to the Appellant's submissions that the competitor Kennametal (Respondent 03) had obtained the WG-300 sample in "an unclean way".

Therefore, a public prior use of WG-300 is not proven.

7. *Problem and Solution*

7.1 The Board accepts the Appellant's submissions that document (11) be regarded as the closest prior art; this was no longer disputed by the Respondents at the oral proceedings.

7.2 Document (11) dating from 1969 is a final technical report giving results of a continued effort designed to develop new and improved ceramic cutting tool inserts for the more efficient and economical machining of the refractory hard metals required in the fabrication of aerospace devices. The report is subdivided into two groups of tool materials, on the one hand carbide boride and nitride tools and on the other hand alumina based tools. In respect of the latter group the report describes "Alumina + Metal Nitride Systems", "Alumina + Metal Boride Systems", "Alumina + Metal Carbide Systems"; "Aluminum Oxide - Magnesia - Silicon Carbide Systems" and "Aluminum Oxide - Magnesia - Tungsten Carbide Systems". Under the heading "Cutting Tool Evaluation Tests", the subparagraph "Al₂O₃ - Additive Systems" on page 186 last paragraph including a reference to Table 80 on page 188, cutting test results with a workpiece of steel inter alia on tools from the system 95 wt% modified alumina and 5 wt% silicon carbide whiskers are represented. The modified alumina

comprises 98.75 wt% Al_2O_3 and 1.25 wt% MgO. According to Table 80 a modified alumina without an additive shows a more than ten times better tool life than said whisker modified composition.

In view of the test results, it is then concluded that due to the high chemical reactivity of silicon carbide with the work metal, no improvement of wear resistance could be attained. As an overall result it is stated on page 197 fifth paragraph, that cutting tests performed with tools fabricated from the system modified Al_2O_3 - SiC whiskers showed that these tools had a lower life than modified alumina tools without additives and that such an additive does not improve the tool life of alumina base cutting tool materials.

- 7.3 In the light of the said prior art, the technical problem underlying the patent in suit can be seen in providing an alumina based cutting tool having an improved tool life over alumina tools without additives.

The problem is solved by the whisker-reinforced cutting tool according to present Claim 5 (see paragraph VII above).

According to the experimental evidence in the patent specification, in particular page 7, line 35 up to page 8, line 24, a cutting tool as presently claimed with a content of 25 volume percent silicon carbide whiskers show at least a 1.5 times better tool life than a conventional alumina insert (E). Although these experimental data are based on different cutting conditions than those described in document (11), in view of the extreme test conditions demonstrated in the patent specification with respect to load and thermal cycling of the tool tip, the Board is convinced that there is at least a relative improvement of the cutting

tool according to the invention in comparison with those tested in document (11) and is thus satisfied that the problem has been solved in a plausible manner.

8. *Novelty*

8.1 At the oral proceedings the Appellant did not dispute that the mere wording of the product claims of the present main request and first auxiliary request referring to a range of 2 to 40 volume percent of silicon carbide whiskers embraced the cutting tool according to document (11) with 5 weight percent of silicon carbide whiskers. It was, however, argued that in the light of the decision G 2/88 the term whiskers according to the invention should be regarded as carrying a new functional feature which provides a surprising effect and thus this effect must be read into the claim as a distinguishing characteristic. The Board cannot accept this argument since the relevant passages of the decision G 2/88 relate only to a question referred to the enlarged Board of Appeal with respect to *use* claims. Accordingly, the said decision is not applicable to product claims. Moreover, the present sets of independent product claims do not comprise any concrete physical or chemical parameters characterising the whiskers used which might have served to distinguish them from the whiskers known from document (11)..

Novelty of the subject matter of Claims 6 of the main request and of the first auxiliary request can accordingly not be recognised under Article 54 EPC.

8.2 After examination of the cited prior art, the Board concludes that the subject-matter according to the second auxiliary request is novel. Since novelty of the independent method Claim 1 and independent product

Claim 5 of this request referring to 12 to 40 volume percent of whiskers has not been disputed by the Respondents, it is no longer necessary to consider this matter in detail.

9. *Inventive step*

9.1 Although document (11) explains the difficulty of using silicon carbide in a cutting tool due to the high chemical reactivity of this material with steel as a work metal, its teaching would not inhibit the skilled person from using it in cutting tools for workpieces other than steel. However, the overall test results in (11) are such that, as already indicated above under point 7.2, there would be no incentive to continue to develop new cutting tools on the basis of alumina reinforced with silicon carbide whiskers. Moreover, since (11) proposes a broad spectrum of materials other than silicon carbide whiskers suitable as additives to alumina not showing so serious negative effects, the skilled person's attention is clearly shifted in the direction of other additives, such as metal carbide, nitride and boride systems referred to therein.

9.2 More than 20 years elapsed after document (11) was made available to the public before the next reference to silicon carbide whiskers in ceramic cutting tool materials occurred in the form of document (1), an advertisement headed "Greenleaf Introduces the Most Significant Advance in Cutting Tool Materials since Coated Carbides". According to said advertisement the so-called "Ceramic Composites" are proven ceramic cutting tool materials reinforced with a lattice of small single crystal silicon carbide whiskers. This

material, offered under the trade name WG-300, is described as having excellent cutting properties with e.g. ground-in chipforms on interrupted cuts at low and high speeds.

As regards the unspecified ceramic material mentioned in the said advertisement the Respondents made inter alia reference to documents (4), (7), (8) and (9). The Board agrees that these documents show that alumina dates back to the early 1900's as the only ceramic cutting tool material used in industry and remained an important material for this purpose up to the priority date of the patent in suit.

Prima facie it might have appeared, in the light of this historical review, that alumina would be the obvious choice for the unspecified ceramic body referred to in (1).

However, when deciding on the question whether or not the skilled person would, in the light of the disclosure of the advertisement according to (1), have had an incentive to arrive at the solution of the technical problem underlying the patent in suit, the developments in the field of cutting tools which had taken place in the period since publication of the studies on which document (11) is based would inevitably have been taken into consideration. In other words, for practical purposes, the skilled person would not have ignored the whole trend in the field of ceramics in general and in particular of cutting tools at the priority date.

9.3 In this respect the Board sees no reason to doubt that the documents filed by the Respondents could represent a trend concerning the use of whiskers and the matrix materials in industry.

Document (12), the so-called Tateho-Report, relates to properties and the use of silicon nitride whiskers and silicon carbide whiskers. On page 22 of this document "machining tool" as a use of silicon carbide material is mentioned beside other uses such as furnace material, pump parts etc. Table 8 on page 24 shows examples of matrices with silicon carbide whiskers to demonstrate shock strength of the reinforced ceramics. The examples comprise four silicon nitride and three silicon carbide matrices. The report also describes the excellent thermal shock resistance of reinforced sialons. Alumina is only mentioned as an aid at low concentrations of ca. 3 weight percent.

Document (6) is headed "High-tech ceramics" and mentions in general terms on page 26 that because of their hardness and wear resistance these ceramics find many uses, including cutting tools and bearings. On page 35 it is then stated in connection with the manufacture of whiskers that silicon carbide whiskers have been used to boost the fracture toughness of aluminum oxide, zirconium oxide and other ceramics. There is no hint that a whisker reinforced alumina might be used as a cutting tool.

Document (10) describes, in an abstract, sialon based ceramics reinforced with silicon nitride whiskers useful for cutting tools and abrasion resistant tools.

The somewhat older document (13) describes with respect to the problem of tool wear and the chemistry of metal cutting the interaction of silicon carbide with steel, which was already known from (11). At the end of the chapter on page 203, right column, it is stated that "even the traditional application of white alumina cutting tools for the machining of brake drums is now being replaced by silicon nitride tools where rough and

semi-finish turning is being performed at speeds ranging from 4200 to 5000 sfpm". The rest of this publication, which exclusively relates to cutting tool materials, refers inter alia to sialon ceramic tools, alumina tools with zirconia or titanium carbide as additives and boron carbide composites. It is concluded that "not only will existing materials be further improved with respect to mechanical properties, wear resistance, tool life etc., but entirely new families of ceramic tool materials will be introduced into the field".

Although documents (3) and (5), both published a short time before the priority date of the patent in suit, relate to silicon carbide whisker reinforced alumina bodies within the claimed percentage range (cf. (5) chapter experimental procedures and (3) Table 1), it is to be noted that these documents describe materials for use as structural components in heat engines and high temperature energy conversion systems.

In the Board's judgement the skilled person would have taken into account the proven trend to new matrix materials. It is in no way realistic to ignore the teaching of each of the prior art documents unambiguously relating to a large number of ceramic materials other than alumina suitable as cutting tool matrices and to regard alumina as the only suitable matrix material. There would therefore have been no reason to combine the disclosure of (3) and (5) with the publicity campaign according to (1).

Accordingly, there would not have been the slightest incentive when taking into account the aforementioned prior art relating to the development in the field of cutting tools and even ceramics in general, to overturn the poor reputation of the silicon carbide whiskers

reinforced ceramic cutting tools of document (11) and so to use this material, against the trend in the art, in order to improve by a much higher whisker content the tool life of alumina based materials.

- 9.4 Document (2) relating to a mixture of silicon carbide particles and alumina particles for cutting tools was published about ten years before document (11) and was combined by the Opposition Division with document (1), with respect to its silicon carbide content. It is clearly not relevant when discussing an improvement of tool life of a whisker reinforced alumina matrix.
- 9.5 The other prior art cited during the procedure is deemed to be of less relevance than the documents discussed above.
- 9.6 It is accordingly the Board's view that the subject-matter of the independent product claim of the second auxiliary request would not have been obvious from either citation taken singly or in combination. Thus, the required inventive step is not lacking and Claim 5 as well as method Claim 1 including the new and inventive cutting tool together with dependent Claims 2, 4 and 6, satisfy the requirements of Article 56 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of the second auxiliary request, i.e. Claims 1 and 5 (originally 6) filed on 15 March 1995, and Claims 2 to 4 and 6 (originally 7) as granted, and a description to be adapted thereto.

The Registrar:

P. Martorana

The Chairman:

I. A. Holliday



58.7.92
5